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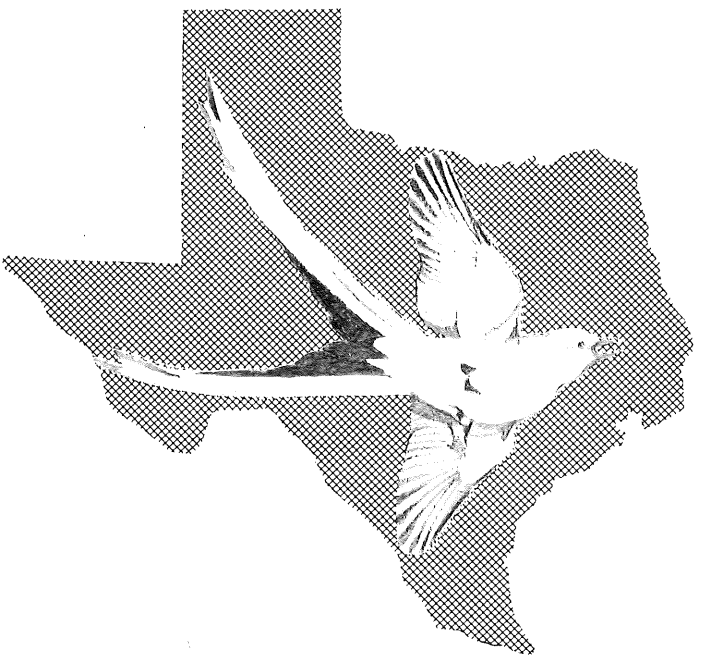

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# TEXAS ORNITHOLOGICAL SOCIETY

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## Contents

# THE BIRDS COLLECTED AT SAN ANTONIO BY A. L. HEERMANN

STANLEY D. CASTO
*Department of Biology, University of Mary Hardin-Baylor, Belton, Texas 76513*

ABSTRACT.—A. L. Heermann collected birds at San Antonio from early 1854 until his death in 1865. His recently discovered papers indicate that he kept a fairly large inventory of skins and that he exchanged a series of eggs with Alfred Newton in 1861. Significant records attributed to Heermann include specimens of the Golden-cheeked Warbler (*Dendroica chrysoparia*), Snowy Owl (*Nyctea scandiaca*), Buff-breasted Sandpiper (*Tryngites subruficollis*), and Eskimo Curlew (*Numenius borealis*). A list of all species collected or recorded at San Antonio by Heermann, as well as a previously unpublished photograph of him as a young man are included herein.

Adolphus Lewis Heermann (c. 1821–1865) arrived in San Antonio in early 1854 with the survey party of Lt. John G. Parke. During the next few years, Heermann collected freshwater mussels and amphibians and reptiles in the vicinity of San Antonio and along the Medina River (Casto 1995). Heermann also collected birds but published no records. He did, however, share many of his observations with H. E. Dresser, who published them following Heermann's death in 1865.

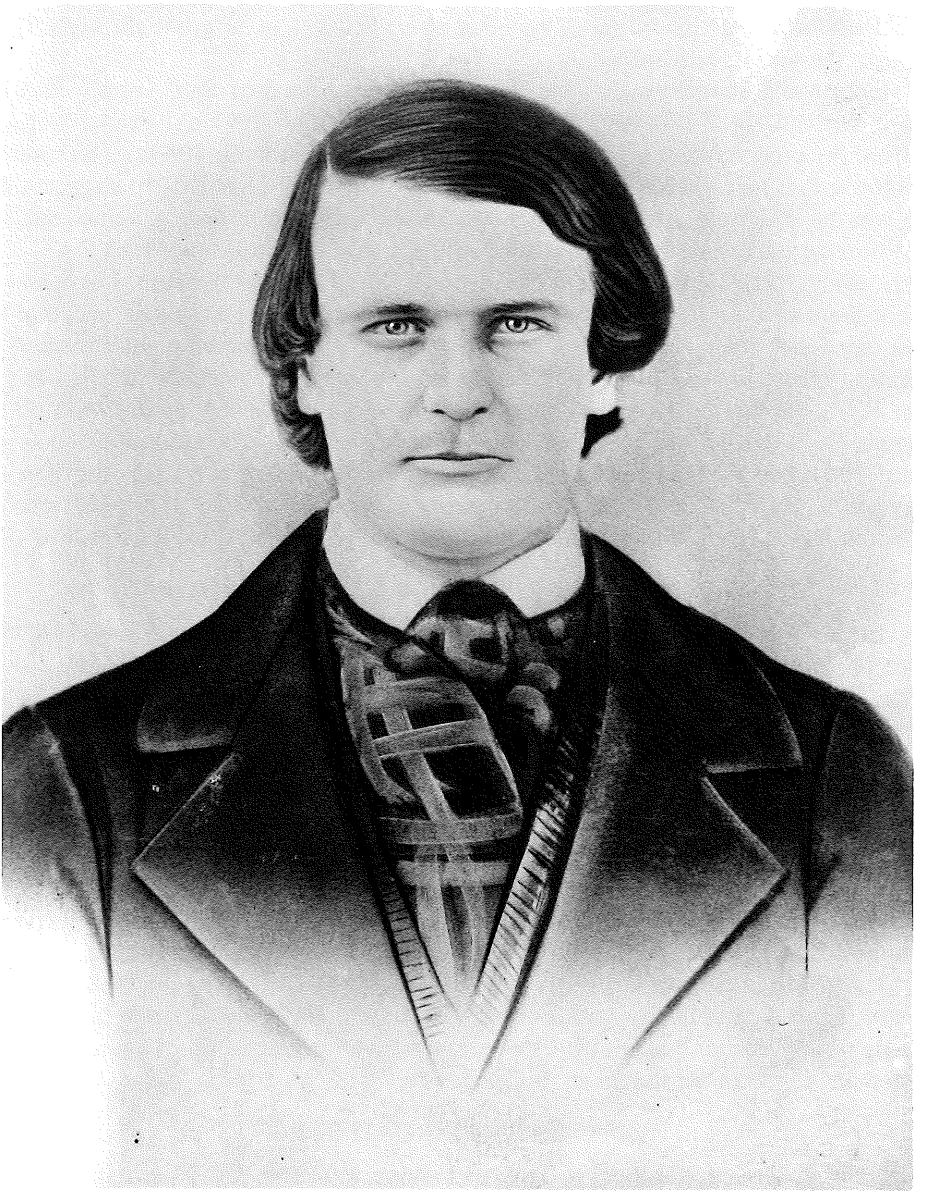
The Heermann Ranch headquarters on the Medina River where Adolphus collected many of his birds is now a designated archaeological site (Thoms and Ahr 1995). In addition, the recently discovered notebook and personal correspondence of Adolphus has provided an inventory of the birds that he collected, as well as an insight into his relationship with Alfred Newton and Spencer Baird. It is, therefore, the purpose of this paper to review the ornithological work of Adolphus Heermann at San Antonio in the context of this new information. Also included herein is a never before published photograph of A. L. Heermann as a young man.

## HEERMANN RANCH ON THE MEDINA RIVER

Adolphus spent the spring of 1854 and the winter of 1855–1856 in San Antonio with his brother, Theodore, who was then living in the city. In 1855 Theodore purchased 738 acres on the south side of the Medina River. In the following year, he began construction of a large dwelling on an alluvial terrace overlooking the river. This three-story edifice of hewn limestone blocks was never completed and along with a rock barn, a frame building, and the family cemetery comprise the archaeological area known as the Heermann Ranch site (Highley and Hindes 1995). By 1860 the ranch, owned jointly by Theodore and Adolphus, consisted of 2,691 acres on the south side of the Medina River. On the north side of the river and slightly upstream was the ranch of George T. Howard on which Adolphus also collected many of his specimens.

## A CASE OF MISTAKEN IDENTITY

In the spring of 1854, while riding on the prairie near San Antonio, Adolphus observed a number of small, plover-like birds running through the grass. Intrigued



ADOLPHUS LEWIS HEERMANN

Member Philadelphia Academy of Natural Sciences, Collector, Physician-Naturalist, and namesake for a gull, song sparrow, freshwater mussel, kangaroo rat, tree squirrel, and bullsnake.

by their behavior, he searched for and found what he believed to be their nests. A specimen of this bird was collected by John G. Parke and presented to Heermann who wrote a description that was published only a few months later (Heermann 1854). Unknown to Heermann, the bird described by him as the Mottled Grass Plover (*Actidurus naevius*) had been described over 30 years earlier from a specimen collected in Paraguay. The Mottled Grass Plover is today known as

the Buff-breasted Sandpiper (*Tryngites subruficollis*), a migrant through Texas during the spring and fall.

Heermann's statement that his "new" species nested at San Antonio did not go unnoticed. In July 1859, he received a letter from the English ornithologist Alfred Newton requesting eggs of the Grass Plover (Newton 1859a). Heermann's response that he did not "presently" have any eggs (Newton 1859b) suggests that he was by this time aware that this species did not nest at San Antonio and that the nest he had described earlier was actually that of some other bird.

In early 1861 Heermann sent the eggs of 98 species to Newton, but many of them were broken in transit. Although disappointed by the breakage and that the shipment did not contain the eggs of the Grass Plover, Newton reciprocated by sending Heermann the eggs of 100 European species (Newton 1861a). In November 1861, for the third and last time, Newton again expressed his desire to obtain eggs of the Grass Plover. Heermann apparently never responded and it was not until 1864 that he renewed his contact with the Englishman by sending him the eggs of a Harris' Hawk (*Parabuteo unicinctus*), that he had collected near the Medina River (Dresser 1865:329).

## CORRESPONDENCE WITH BAIRD AND KRIDER

The archives of the Smithsonian Institution contain copies of several letters sent by Spencer Baird to Heermann while he was living in San Antonio. In one letter dated 16 June 1859, Baird thanked Heermann for offering the use of his "oological rarities" for the work on North American birds then being prepared by himself, T. M. Brewer, and Robert Ridgway. *The Annual Report of the Smithsonian Institution* for 1861 mentions a collection of "skins and eggs of North American birds" received from Heermann. Although the specimens in this shipment cannot be specifically identified, the National Museum of Natural History does contain a number of birds collected in Texas by Heermann (Angle 1994). Most specimens are presumably those collected during 1853–1854 while Heermann was a member of the Pacific Railroad Survey. In letters written to John Krider in Philadelphia during the winters of 1854–1855 and 1855–1856, Heermann mentioned collecting a number of birds at San Antonio. These letters were available to Witmer Stone (1907) when he wrote his memorial of Heermann but, unfortunately, can no longer be located.

## THE PACIFIC RAILROAD REPORTS

The sections of the Pacific Railroad Report written by Heermann (1859a, 1859b) contain references to only six species of birds occurring at San Antonio (Table 1). The first of these was the Buff-breasted Sandpiper collected on the prairie near the city. Twenty to 30 Crested Caracara (*Polyborus plancus*) were often seen at the same time in the vicinity of the slaughter houses near San Antonio. Heermann also noted that the banks of the San Antonio River were not suitable for the nesting of Northern Rough-winged Swallow (*Stelgidopteryx serripennis*) and that this species was forced to nest in the holes and crevices of houses, a particularly large colony being found in the walls of the Plaza House. The Orchard Oriole (*Icterus spurius*), Golden-fronted Woodpecker (*Melanerpes aurifrons*), and Northern Bobwhite (*Colinus virginianus*) were noted simply as being abundant around San Antonio.

Table 1. Birds observed or collected at San Antonio by A. L. Heermann. Each vernacular name is followed by the A.O.U. reference number given in the *Check-list of North American Birds,* 1983. Information in the second column is from Heermann's notebook "Birds on hand at present in Texas," and "Eggs on hand in Texas." The comments in the third column are those of Dresser (1865, 1866) attributed to Heermann. Abbreviations are male (M), female (F), immature (I), A. L. Heermann (ALH), Atascosa River (AR), Howard Ranch (HR), Medina River (MR), and San Antonio (SA).

| Name of bird | Heermann's list | Dresser's paper | Other sources |
|---|---|---|---|
| Tricolored Heron 199 | skin (1) | — | — |
| Reddish Egret (Red) 198 | — | common in summer | — |
| Reddish Egret (White) 198 | — | common in summer | — |
| Yellow-crowned Night-Heron 203 | skin (M,I) | — | — |
| Wood Stork 188 | skin (M) | — | — |
| Mottled Duck 149.1 | skin (M) | shot near SA | — |
| Blue-winged Teal 140 | — | breeds on AR | — |
| Black Vulture 326 | skin (M) | eggs taken on AR | — |
| Turkey Vulture 325 | skin (M) | — | — |
| Amer. Swallow-tailed Kite 327 | skin (M) | — | — |
| Mississippi Kite 329 | skin (M,F,I) | — | — |
| Northern Harrier 331 | skin (2M) | — | — |
| Cooper's Hawk 333 | skin (M,2F) | — | — |
| Harris' Hawk 335 | skin (M,F) | eggs taken near MR | — |
| Red-shouldered Hawk 339 | skin (M,F,I) | — | — |
| "Red-bellied" Hawk 339 | skin (M) | — | — |
| Red-tailed Hawk 337 | skin (M) | eggs taken on MR | — |
| "Harlan's Hawk" 337 | skin (M) | eggs taken on MR | — |
| Crested Caracara 362 | skin (M), eggs (1) | — | large numbers at SA[1] |
| Merlin 357 | skin (M) | — | — |
| Prairie Falcon 355 | skin (2I) | seen carrying young turkey | — |
| Montezuma Quail 296 | — | — | eggs taken near SA[2] |
| Northern Bobwhite 289 | skin (3M,F), eggs (10) | — | abundant[3] |
| Yellow Rail 215 | — | common | — |
| Virginia Rail 212 | — | shot on several occasions | taken several times[2] |
| Purple Gallinule 218 | — | shot near SA | — |
| Sandhill Crane 206 | skin (M) | — | — |
| Lesser Golden-Plover 272 | skin (M,F) | — | — |
| Mountain Plover 281 | skin (2M) | — | — |
| Spotted Sandpiper 263 | skin (M) | — | — |
| Upland Sandpiper 261 | skin (M) | — | — |
| Eskimo Curlew 266 | — | — | skin[3] |
| Whimbrel 265 | skin (2M) | — | — |

Table 1. Continued.

| Name of bird | Heermann's list | Dresser's paper | Other sources |
|---|---|---|---|
| Buff-breasted Sandpiper 262 | skin (M) | seen in spring and fall | common[1] |
| Mourning Dove 316 | eggs (8) | — | — |
| Yellow-billed Cuckoo 387 | eggs (2) | — | skin & eggs[3] |
| Barn Owl 365 | — | specimen sent to ALH | skin[3] |
| Great Horned Owl 375 | skin (M,I) | — | — |
| Snowy Owl 376 | — | taken before Civil War | — |
| Burrowing Owl 378 | skin (2M) | — | — |
| Short-eared Owl 367 | — | common in winter | — |
| Common Nighthawk 420 | skin (M) | — | — |
| Common Poorwill 418 | — | taken on MR | — |
| Chuck-will's-widow 416 | — | breeds locally | — |
| Green Kingfisher 391 | skin (F,2I) | — | — |
| Red-headed Woodpecker 406 | skin (I) | — | — |
| Golden-fronted Woodpecker 410 | skin (M,F,I) | nests only in mesquite | abundant[1] |
| Red-bellied Woodpecker 409 | skin (2M,I) | — | — |
| Yellow-bellied Sapsucker 402 | skin (M,F) | eggs taken on MR | — |
| Ladder-backed Woodpecker 396 | skin (2M,F) | — | — |
| Downy Woodpecker 394 | skin (F) | collected on MR | collected on HR[2] |
| Northern Flicker 412 | skin (M) | — | — |
| Pileated Woodpecker 405 | skin (M) | — | — |
| Olive-sided Flycatcher 459 | skin (2M) | — | — |
| Yellow-bellied Flycatcher 463 | skin (M) | — | — |
| Willow Flycatcher 466 | skin (M) | — | — |
| Vermilion Flycatcher 471 | — | specimen sent to ALH | — |
| Ash-throated Flycatcher 454 | skin (2M) | — | — |
| Eastern Kingbird 444 | — | seen in spring and summer | — |
| N. Rough-winged Swallow 617 | — | — | common[1] |
| Bank Swallow 616 | skin (I) | — | — |
| Tufted Titmouse 731 | skin (M) | — | — |
| Brown Creeper 726 | — | nests found on MR | — |
| Canyon Wren 717 | — | eggs taken on ALH ranch | — |
| Carolina Wren 718 | — | eggs taken on ALH ranch | — |
| Bewick's Wren 719 | — | eggs taken on ALH ranch | — |
| Eastern Bluebird 766 | — | breeds locally | — |
| Mountain Bluebird 768 | — | comes in winter | — |
| Hermit Thrush 759 | — | eggs taken on MR | — |
| Northern Mockingbird 703 | eggs (1) | — | — |

Table 1. Continued.

| Name of bird | Heermann's list | Dresser's paper | Other sources |
|---|---|---|---|
| Sage Thrasher 702 | skin (M) | — | — |
| Loggerhead Shrike 622 | skin (M) | — | — |
| Bell's Vireo 633 | skin (M) | nests on MR | — |
| Warbling Vireo 627 | — | breeds locally | — |
| Nashville Warbler 645 | skin (M) | — | — |
| Black-throated Blue Warbler 654 | skin (M) | — | — |
| Yellow-rumped Warbler 655 | skin (M) | overwinter locally | — |
| Golden-cheeked Warbler 666 | — | collected on HR | — |
| Yellow-throated Warbler 663 | skin (M) | seen at Brownsville | — |
| Black-and-White Warbler 636 | — | breeds on MR | — |
| Northern Waterthrush 675 | — | summers on MR | — |
| Kentucky Warbler 677 | skin (2M) | — | — |
| Mourning Warbler 679 | skin (2M) | spring migrant | — |
| Hooded Warbler 684 | skin (M) | — | — |
| Summer Tanager 610 | skin (2M,I) | — | — |
| Scarlet Tanager 608 | — | shot on MR | — |
| Northern Cardinal 593 | skin (M,F), eggs (6) | — | — |
| Rose-breasted Grosbeak 595 | — | one seen near SA | — |
| Painted Bunting 601 | skin (M), eggs (10) | — | — |
| Dickcissel 604 | — | eggs collected on MR | — |
| Rufous-sided Towhee 587 | skin (2M) | — | — |
| Clay-colored Sparrow 561 | — | first seen in 1864 | — |
| Lark Sparrow 552 | eggs (12) | — | eggs[3] |
| Black-throated Sparrow 573 | skin (M) | — | — |
| Lark Bunting 605 | skin (M) | — | — |
| Grasshopper Sparrow 546 | skin (M) | common in summer | — |
| Harris' Sparrow 553 | skin (2M) | — | — |
| Dark-eyed Junco 567 | — | found occasionally | — |
| Chestnut-collared Longspur 538 | — | shot on San Pedro Creek | — |
| Red-winged Blackbird 498 | eggs (2) | — | — |
| Western Meadowlark 501.1 | skin (M) | — | — |
| Brown-headed Cowbird 495 | — | — | eggs[3] |
| Orchard Oriole 506 | — | — | abundant[1] |
| Cassin's Finch 518 | skin (M) | breeds near MR | — |
| American Goldfinch 529 | — | common in summer | — |

[1] Information from Pacific Railroad Reports.
[2] Information from Oberholser's typescript of *The Bird Life of Texas*.
[3] Specimens collected by Heermann in the Manchester Museum, University of Manchester, Manchester, England.

## THE BIRDS IN HEERMANN'S NOTEBOOK

Included within the Heermann family papers is a small notebook that once belonged to Adolphus Heermann. Most of the entries in the notebook pertain to Heermann's business dealings and financial records. There are, however, five pages on which a list of skins is given under the heading "Birds on hand at present in Texas." The list contains the binomial names of 64 species for which 105 specimens (male, female, or immature) are given. A second list entitled "Eggs on hand in Texas" lists nine species and the number of eggs of each species in stock. The lists are not dated nor are there dated entries either preceding or following the lists.

The binomial names in Heermann's lists are preceded by identifying numbers that correspond to the numbers in Baird's *Catalogue of North American Birds* published in 1858. It can therefore be assumed that Heermann's lists were made sometime after the publication of Baird's catalogue. A complete list of the birds and eggs in Heermann's notebook is given in Table 1.

## ASSOCIATION WITH H. E. DRESSER

Adolphus suffered for many years from the neurological effects of syphilis. In January 1862, he was described as being in a "helpless and crippled condition, arising from a general paralysis" (Heermann 1862). However, in spite of his poor health, Adolphus was able to travel to Philadelphia where he worked at the Academy of Natural Sciences during 1862.

Heermann apparently lost contact with his associates after returning to Texas and it was widely believed that he was dead. The English ornithologist Henry Eeles Dresser was therefore greatly surprised to find Heermann alive when he arrived in San Antonio on 16 September 1863. Although physically impaired, Heermann was able to ride and he often ventured into the field, firing from the saddle at birds he wished to collect (Dresser 1906). Over the next several months Adolphus provided Dresser with suggestions on the best places to collect, as well as assisting in the preparation of specimens. More importantly, Heermann shared his observations regarding the birds of the area. Dresser's paper on the birds of southern Texas, published during 1865 and 1866, acknowledges Heermann as the source of information for over 40 species observed or collected near San Antonio or along the San Antonio, Medina, and Atascosa Rivers. Dresser's collection, now in the museum at the University of Manchester, contains several birds taken by Heermann (Table 1). As late as the spring of 1864 Adolphus was still able to ride to his ranch on the Medina where he and Dresser collected wren eggs from the nest boxes that Heermann had set out during the previous season. Heermann also enlisted the aid of Duncan Ogden, Jr., age 17, who in the spring of 1864 brought his mentor a Golden-cheeked Warbler (*Dendroica chrysoparia*) that he had collected on his step-uncle's property (the Howard Ranch) on the Medina River. This specimen was given to Dresser and is today in the British Museum of Natural History (Pulich 1976). Dresser left San Antonio for England in July 1864. In November he sent Adolphus a list of the eggs of European birds that he wished to exchange for skins of Texas birds. Dresser also wanted the eggs of the American Swallow-tailed Kite (*Elanoides forficatus*) and suggested to Heermann that, if he felt strong enough, he might go to "Cunningham's Stage Stand" on the

Brazos where he could arrange for the locals to collect the eggs of this species (Dresser 1864). There is no evidence that any exchange of eggs or skins ever took place.

## SIGNIFICANT RECORDS

Most of the birds that Heermann recorded at San Antonio were common species that are still found in the area (Table 1). Significant records include the first specimens of the Buff-breasted Sandpiper and Snowy Owl (*Nyctea scandiaca*) from Texas, as well as one of the earlier (1861) Eskimo Curlew (*Numenius borealis*) collected in the state. It is not clear whether the Snowy Owl was actually collected by Heermann or by a second party who perhaps brought it or reported its occurrence to him (see Dresser 1865:330). The Golden-cheeked Warbler collected for Heermann by Duncan Ogden, Jr. represents the first individual of this species taken in the United States.

On 2 September 1865, while collecting on the prairie near San Antonio, Heermann apparently stumbled, causing his gun to discharge, killing him instantly. Family tradition maintains that Adolphus is buried in an unmarked grave in the Heermann family cemetery on the Medina River. The disposition of Heermann's ornithological specimens following his death is unknown.

## ACKNOWLEDGMENTS

I am grateful to Jacqueline Falbo of San Antonio, Texas, for providing access to the Heermann family papers and for the photograph of Adolphus Heermann. Appreciation is also extended to Lynn Highley who directed my attention to the lists of birds and eggs in Heermann's notebook. This study was supported by a summer development leave granted by the University of Mary Hardin-Baylor.

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# SPECIES USING RED-COCKADED WOODPECKER CAVITIES IN EASTERN TEXAS

RICHARD N. CONNER, D. CRAIG RUDOLPH, DANIEL SAENZ, AND RICHARD R. SCHAEFER

*Wildlife Habitat and Silviculture Laboratory*[1], *Southern Research Station, U.S. Forest Service, Nacogdoches, Texas 75962*

ABSTRACT.—Because of its ability to excavate cavities in living pines, the Red-cockaded Woodpecker (*Picoides borealis*) is a keystone species in the fire-disclimax, pine ecosystems of the southeastern United States. Many species representing multiple taxonomic classes are dependent on this woodpecker species for the cavities it creates. We examined the occupants of Red-cockaded Woodpecker cavities during spring, late summer, and winter. Cavities enlarged by other species of woodpeckers and unenlarged cavities were examined in two habitat conditions: loblolly (*Pinus taeda*)-shortleaf (*P. echinata*) pine and longleaf pine (*P. palustris*) habitats. Red-cockaded Woodpecker cavities provided cavity habitat for seven species of birds, two species of squirrels, skinks, frogs, spiders, moths, and numerous species of Hymenoptera.

The Red-cockaded Woodpecker (*Picoides borealis*) is a cooperative breeder (Ligon 1970) that lives in family groups composed of a breeding pair and one to several helpers (Walters et al. 1988; Walters 1990). It excavates cavities into the heartwood of pines that typically are infected with red heart fungus (*Phellinus pini*) (Conner and Locke 1982; Hooper 1988; Hooper et al. 1991; Rudolph et al. 1995). Red-cockaded Woodpeckers are a keystone species of the fire-disclimax, pine ecosystem of the South because they are the primary species to excavate cavities in what can be an otherwise cavity-barren environment (Conner and Rudolph 1995). Cavity excavation by Red-cockaded Woodpeckers in live pines requires a relatively long period of time averaging 1.8 y in loblolly pines (*Pinus taeda*), 2.4 y in shortleaf pines (*P. echinata*), and 6.3 y in longleaf pines (*P. palustris*) (Conner and Rudolph 1995). Thus, the cavities they create tend to be in high demand by other species (Dennis 1971; Rudolph et al. 1990b; Loeb 1993; Conner et al. 1996).

Red-cockaded Woodpeckers peck shallow excavations, termed resin wells, around their cavity entrances. Daily pecking at these sites causes a copious flow of pine resin from resin wells down the trunk of the pine (Ligon 1970). The combined effects of bark scaling and resin flow create a barrier against climbing rat snakes (*Elaphe obsoleta*) (Jackson 1974; Rudolph et al. 1990a), but this barrier has little deterrent effect against southern flying squirrels (*Glaucomys volans*), which are frequent users of unenlarged cavities (Rudolph et al. 1990b; Loeb 1993).

Pileated Woodpeckers (*Dryocopus pileatus*) enlarge many Red-cockaded Woodpecker cavities by expanding the cavity entrance tube and sometimes the cavity chamber by excavation. Occasionally, Pileated Woodpeckers fully excavate

[1] *Maintained in cooperation with the Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, Texas 75962, USA.*

the cavity chamber and nest in what used to be a Red-cockaded Woodpecker cavity (Conner et al. 1991). Over a 9 year period Pileated Woodpeckers enlarged 55 Red-cockaded Woodpecker cavities on the Angelina National Forest in eastern Texas (Conner and Rudolph 1995). An average of 6.1 cavities were enlarged per year, representing 2.4 percent of the cavity trees present each year on the forest. The enlarged cavities created by this woodpecker provide cavity habitat for many other relatively large secondary cavity users.

Approximately 24 species of vertebrates are known to use Red-cockaded Woodpecker cavities (Dennis 1971; Baker 1971; Beckett 1971; Hopkins and Lynn 1971; Jackson 1978; Harlow and Lennartz 1983; Rudolph et al. 1990b; Loeb 1993; Kappes and Harris 1995). Although the majority of these vertebrates use either enlarged or abandoned cavities, several such as Red-bellied (*Melanerpes carolinus*) and Red-headed (*M. erythrocephalus*) woodpeckers and southern flying squirrels appear to actively compete with Red-cockaded Woodpeckers for normal, unenlarged cavities. Previous studies typically evaluated cavity occupants during the woodpecker breeding season and not late summer and winter.

Our objective was to determine which species used enlarged and unenlarged Red-cockaded Woodpecker cavities during spring, late summer, and winter in Texas.

## STUDY AREAS AND METHODS

The study was conducted on the Angelina (62,423 ha; 31°15′N, 94°15′W) and Davy Crockett (65,329 ha; 31°21′N, 95°07′W) National Forests from March 1990 to October 1991. We examined 11 Red-cockaded Woodpecker cavity-tree clusters in longleaf pine habitat and 17 clusters in loblolly-shortleaf pine habitat during daylight hours. Using Swedish climbing ladders, we climbed and examined approximately 230 cavity trees for occupancy during the spring (April and May) of 1990 and 1991, the late summer (August to early October) of 1990 and 1991, and the winter of 1990–1991 (December 1990 to February 1991). Each cavity was examined once during each season. We lowered a small, high intensity light into each cavity chamber and determined cavity occupancy with an oval mechanics mirror mounted on a extendable handle. The presence of bird eggs of a particular species was assumed to indicate use by adults of the same species. We used presence of chewed pine needles and fresh flying squirrel feces as an indicator of flying squirrel use. Unchewed pine needles in an enlarged cavity indicated use by fox squirrels (*Sciurus niger*). We measured the entrance diameters of cavities for comparison with species use. Based on previous studies (Rudolph et al. 1990b, Loeb 1993), cavities were divided into those suitable for Red-cockaded Woodpecker use (entrance diameters $< 7$ cm in diameter) and those too enlarged to be of value to Red-cockaded Woodpeckers (entrances $> 7$ cm in diameter).

## RESULTS AND DISCUSSION

A variety of vertebrates and invertebrates were observed using enlarged and unenlarged Red-cockaded Woodpecker cavities (Table 1). Although numerous species used Red-cockaded Woodpecker cavities, unoccupied (empty) enlarged and unenlarged cavities were still available in most clusters during spring, late summer, and winter (Table 2). Red-cockaded Woodpeckers preferred unenlarged cavities during all seasons. In only two of 369 instances did they use enlarged

Table 1. Wildlife species observed using enlarged and unenlarged Red-cockaded Woodpecker cavities in loblolly-shortleaf pine and longleaf pine forest types in eastern Texas during 1990 and 1991.

| | Loblolly-shortleaf pine | | | | Longleaf pine | | | |
|---|---|---|---|---|---|---|---|---|
| | Cavity entrance diameter | | | | Cavity entrance diameter | | | |
| | < 7 cm ($n$ = 502) | | ≥ 7 cm ($n$ = 183) | | < 7 cm ($n$ = 295) | | ≥ 7 cm ($n$ = 111) | |
| Cavity occupant | % use | (no.) | % use | (no.) | % use | (no.) | % use | (no.) |
| Southern flying squirrel | 19.3 | (97) | 26.8 | (49) | 29.5 | (87) | 16.2 | (18) |
| Fox squirrel | 0.0 | (0) | 3.3 | (6) | 0.0 | (0) | 7.2 | (8) |
| Red-cockaded Woodpecker | 48.0 | (241) | 0.5 | (1) | 42.7 | (126) | 0.9 | (1) |
| Pileated Woodpecker | 0.0 | (0) | 1.1 | (2) | 0.0 | (0) | 0.9 | (1) |
| Red-bellied Woodpecker | 0.8 | (4) | 0.0 | (0) | 0.3 | (1) | 0.0 | (0) |
| Wood Duck | 0.0 | (0) | 2.2 | (4) | 0.0 | (0) | 0.9 | (1) |
| Eastern Screech-Owl | 0.2 | (1) | 3.3 | (6) | 0.7 | (2) | 4.5 | (5) |
| American Kestrel | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 0.9 | (1) |
| Great Crested Flycatcher | 0.2 | (1) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) |
| Tufted Titmouse | 2.0 | (10) | 3.3 | (6) | 0.0 | (0) | 0.9 | (1) |
| Broad-headed skink | 0.0 | (0) | 0.5 | (1) | 0.0 | (0) | 0.0 | (0) |
| Gray treefrog | 0.6 | (3) | 0.5 | (1) | 0.0 | (0) | 0.9 | (1) |
| Spiders | 0.2 | (1) | 0.5 | (1) | 0.0 | (0) | 0.0 | (0) |
| Moths | 0.2 | (1) | 1.1 | (2) | 0.0 | (0) | 0.0 | (0) |
| Ants | 0.2 | (1) | 0.5 | (1) | 0.3 | (1) | 1.8 | (2) |
| Bees | 0.0 | (0) | 0.5 | (1) | 0.0 | (0) | 0.9 | (1) |
| Mud daubers | 1.0 | (5) | 1.1 | (2) | 1.4 | (4) | 0.9 | (1) |
| Wasps | 1.6 | (8) | 1.6 | (3) | 2.4 | (7) | 1.8 | (2) |
| Water in cavity | 2.2 | (11) | 7.7 | (14) | 0.3 | (1) | 7.2 | (8) |
| Empty | 23.5 | (118) | 45.4 | (83) | 22.4 | (66) | 54.1 | (60) |

cavities, and these two instances occurred only during the late summer when group size is largest due to the presence of young of the year (Table 2).

Southern flying squirrels used unenlarged and enlarged Red-cockaded Woodpecker cavities regularly. Southern flying squirrel use of Red-cockaded Woodpecker cavities was highest during the woodpecker breeding season, dwindled by late summer, and increased slightly during winter (Table 2). The highest number of flying squirrels found in a cavity at one time was eleven and this occurred during the spring of 1990. The average number of southern flying squirrels observed in unenlarged cavities was 3.6 squirrels compared with 0.3 squirrels in enlarged cavities. Rudolph et al. (1990) and Loeb (1993) noted that southern flying squirrels preferred unenlarged Red-cockaded Woodpecker cavities.

American Kestrels (*Falco sparverius*), Eastern Screech-Owls (*Otus asio*), Wood Ducks (*Aix sponsa*), and fox squirrels were observed using cavities infrequently and typically used cavities which had both the entrance and cavity chamber enlarged. Kestrels, screech-owls, and Wood Ducks used cavities only during the spring for nesting whereas fox squirrels used cavities during all three seasons (Table 2). Cavities used by Eastern Screech-Owls and fox squirrels usually contained whole pine needles. Eastern Screech-Owls were observed in three cavities with entrances <7 cm in diameter, but the entrances of these three cavities had been slightly enlarged and were between 6.5 and 7 cm in diameter.

Pileated Woodpeckers, the species responsible for most of the cavity enlargement (Conner et al. 1991), were observed using enlarged cavities infrequently during spring and late summer (Tables 1 and 2). During spring 1990 Pileated

Table 2. Wildlife species observed using enlarged and unenlarged Red-cockaded Woodpecker cavities during spring, late summer, and winter in eastern Texas during 1990 and 1991.

| | Spring | | | | Late summer | | | | Winter | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cavity entrances | | | | Cavity entrances | | | | Cavity entrances | | | |
| | < 7 cm ($n$ = 290) | | ≥ 7 cm ($n$ = 131) | | < 7 cm ($n$ = 329) | | ≥ 7 cm ($n$ = 106) | | < 7 cm ($n$ = 178) | | ≥ 7 cm ($n$ = 57) | |
| Cavity occupant | % use | (no.) | % use | (no.) | % use | (no.) | % use | (no.) | % use | (no.) | % use | (no.) |
| Southern flying squirrel | 36.6 | (106) | 38.2 | (50) | 12.2 | (40) | 11.3 | (12) | 21.3 | (38) | 8.8 | (5) |
| Fox squirrel | 0.0 | (0) | 3.1 | (4) | 0.0 | (0) | 3.8 | (4) | 0.0 | (0) | 10.5 | (6) |
| Red-cockaded Woodpecker | 42.4 | (123) | 0.0 | (0) | 52.0 | (171) | 1.9 | (2) | 40.0 | (73) | 0.0 | (0) |
| Pileated Woodpecker | 0.0 | (0) | 0.8 | (1) | 0.0 | (0) | 1.9 | (2) | 0.0 | (0) | 0.0 | (0) |
| Red-bellied Woodpecker | 0.3 | (1) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 2.2 | (4) | 0.0 | (0) |
| Wood Duck | 0.0 | (0) | 3.8 | (5) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) |
| Eastern Screech-Owl | 1.0 | (3) | 8.4 | (11) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) |
| American Kestrel | 0.0 | (0) | 0.8 | (1) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) |
| Great Crested Flycatcher | 0.3 | (1) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) |
| Tufted Titmouse | 2.4 | (7) | 5.3 | (7) | 0.0 | (0) | 0.0 | (0) | 1.7 | (7) | 0.0 | (0) |
| Broad-headed skink | 0.0 | (0) | 0.8 | (1) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) |
| Gray treefrog | 0.0 | (0) | 0.0 | (0) | 0.9 | (3) | 1.9 | (2) | 0.0 | (0) | 0.0 | (0) |
| Spiders | 0.3 | (1) | 0.8 | (1) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) | 0.0 | (0) |
| Moths | 0.0 | (0) | 0.0 | (0) | 0.3 | (1) | 1.9 | (2) | 0.0 | (0) | 0.0 | (0) |
| Ants | 0.7 | (2) | 0.8 | (1) | 0.0 | (0) | 1.9 | (2) | 0.0 | (0) | 0.0 | (0) |
| Bees | 0.0 | (0) | 0.8 | (1) | 0.0 | (0) | 0.9 | (1) | 0.0 | (0) | 0.0 | (0) |
| Mud daubers | 0.3 | (1) | 0.0 | (0) | 1.5 | (5) | 0.0 | (0) | 1.7 | (3) | 5.3 | (3) |
| Wasps | 0.3 | (1) | 2.3 | (3) | 2.4 | (8) | 1.9 | (2) | 3.4 | (6) | 0.0 | (0) |
| Water in cavity | 1.4 | (4) | 7.6 | (10) | 0.9 | (3) | 2.8 | (3) | 2.8 | (5) | 15.8 | (9) |
| Empty | 13.8 | (40) | 26.7 | (35) | 29.8 | (98) | 69.8 | (74) | 25.8 | (46) | 61.4 | (34) |

Woodpeckers successfully fledged two young from an enlarged Red-cockaded Woodpecker cavity. Baker (1971) mentioned Pileated Woodpecker use of enlarged Red-cockaded Woodpecker cavities but did not mention whether nesting was involved. Red-bellied Woodpeckers used only unenlarged cavities during spring and winter. Tufted Titmice (*Parus bicolor*) used both unenlarged and enlarged cavities during spring for nesting and winter for nocturnal roosting. Great Crested Flycatchers (*Myiarchus crinitus*) were detected only once using an unenlarged cavity during spring as a nest site.

Mud-daubers (Sphecidae) were typically found in inactive cavities. Their mud chambers were tolerated or pecked off when Red-cockaded Woodpeckers began to use a cavity containing mud-dauber nests. The presence of mud-daubers or their nests did not appear to interfere with Red-cockaded Woodpecker use of cavities. However, the presence of paper wasps (Vespidae) with particularly large paper nests and honey bees (*Apis mellifera*) prevented Red-cockaded Woodpecker use of cavities.

Broad-headed skinks (*Eumeces laticeps*) and gray tree frogs (*Hyla versicolor/chrysoscelis*) were observed occasionally within inactive enlarged and unenlarged cavities and, to our knowledge, have not been previously reported to use Red-cockaded Woodpecker cavities. In South Carolina, Dennis (1971) and Harlow and Lennartz (1983) reported that Red-headed Woodpeckers, Eastern Bluebirds (*Sialia sialis*), Northern Flickers (*Colaptes auratus*), White-breasted Nuthatches (*Sitta carolinensis*), and European Starlings (*Sturnus vulgaris*) used Red-cockaded Woodpecker cavities during the spring. We did not detect any of these species using Red-cockaded Woodpecker cavities during spring, late summer, or winter.

In summary, the Red-cockaded Woodpecker is a keystone species within southern pine ecosystems. It provides cavities for many secondary cavity users, and provides sites that Pileated Woodpeckers can enlarge which are in turn used by larger secondary cavity users. The continued existence of this endangered woodpecker in the South is crucial for the maintenance of cavity habitat. Without this woodpecker, the pine ecosystems of the South could suffer a substantial loss of biodiversity.

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# SHORT COMMUNICATIONS

## PREDATION OF GOLDEN-FRONTED WOODPECKER NESTLINGS BY A TEXAS RAT SNAKE

MICHAEL S. HUSAK[1]

*Department of Biology, Angelo State University, San Angelo, Texas 76909*

On 17 June 1996, I observed the probable predation of Golden-fronted Woodpecker nestlings (*Melanerpes aurifrons*) by a Texas rat snake (*Elaphe obsoleta lindheimeri*) at San Angelo State Park, Tom Green County, Texas. Here I report on those observations.

The nest cavity was located 4.15 m above the ground in a live primary branch of a mesquite tree (*Prosopis glandulosa*) along a walking trail within dense mesquite brushland. I had been making daily observations on the nest since the onset of incubation. At the time of predation the nestlings were approximately two weeks old.

On 17 June 1996, I approached the nest at 0630 hours and found it quiet, whereas on previous mornings, as well as the preceding evening, the nestlings could be heard giving almost constant begging *hiss* calls. I had walked approximately 35 m from the nest when I observed the female of the nesting pair fly toward the nest with prey. Within 10 seconds, she began a series of rapid *kek* calls. These calls appear to function as warning calls and are typically heard when individuals are agitated. She flew from the nest to a tree near my position and gave two rolling calls (Selander and Giller 1959) followed by approximately 15 seconds of "displacement tapping" (Cruz 1977). She then flew back toward the nest and repeated the sequence once more before flying >100 m in the opposite direction.

I followed the female and did not return to the nest until 0800 hours. At that time, I saw a Texas rat snake in the cavity entrance. The snake quickly retreated back into the nest. Again I walked away from the nest and at 0806 hours observed the male of the nesting pair fly toward the nest with prey. The male then behaved in an agitated fashion similar to that exhibited earlier by the female. Although I remained in the immediate area for 30 minutes, the snake did not emerge from the cavity. Continued observations of the parents and nest site confirmed the loss of all nestlings.

Woodpecker nests are relatively safe from many vertebrate predators and easily defended (Cruz 1977). The young are, however, vulnerable to snakes, as is evident by reports of predation upon the nestlings of Red-bellied Woodpeckers (*Melanerpes carolinus*) by the black rat snake (*E. o. obsoleta,* cf. Stickel 1972) and Red-cockaded Woodpeckers (*Picoides borealis*) by the gray rat snake (*E. o. spiloides,* cf. Jackson 1978). Birds and their nestlings are common prey of Texas rat snakes in general (Tennant 1984). To the list of woodpeckers preyed upon by rat snakes may now be added the Golden-fronted Woodpecker.

[1] *Present address: Department of Biological Sciences, Mississippi State University, Mississippi State, Mississippi 39762.*

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# NOTES ON THE FEEDING HABITS AND PREY OF ADULT GREAT KISKADEES

ROBERTO LUIS GORENA

*Santa Ana Wildlife Refuge, Rt. 2, Box 202A, Alamo, Texas 78516*

The Great Kiskadee (*Pitangus sulphuratus*, hereafter kiskadee) is a large tyrant flycatcher and a permanent resident of south Texas. Its range is reported to extend from south of Webb County, Texas through Mexico and into central Argentina (Fitzpatrick 1980; Lasley and Sexton 1985, 1993). Kiskadees are very colorful and boisterous birds that attract many northern birders. Kiskadees are commonly found near freshwater ponds or canals in a variety of habitats (Gilliard 1958; Oberholser 1974) where they feed on various insects (Bent 1942), tadpoles (Crump and Vaira 1991), and fish (Bent 1942). Kiskadees have also been reported to occasionally feed on fleshy fruits (Eguiarte and Martinez del Rio 1985; Gehlbach 1987). Few quantitative studies have been conducted of kiskadee foraging behavior (Fitzpatrick 1980).

Adult kiskadees were observed during 1994 and 1995 in both urban and rural (natural) environments in Hidalgo and Cameron counties. Data were collected primarily during the nesting season (Gorena and Brush in prep.) at Santa Ana National Wildlife Refuge. Feeding data were collected year-round. Actively feeding adults were followed for between five to 30 minutes and the following data were recorded: pre- and post-forage perch heights, perch to prey distance, substrate prey was taken from, foraging method, and prey type if identifiable. Heights and distances were estimated and checked periodically for accuracy. Feeding events were recorded if the adult was seen with prey or if it masticated and swallowed (prey was unidentifiable). Prey was not always identifiable, particularly if small. All observations were made with Nikon™ 10×50 binoculars.

A total of 113 foraging events were recorded. Average pre- and post-forage perch heights were 2.5 m (SD = 2.21, range = 0.5–10) and 3.0 m (SD = 2.43, range = 0–10), respectively. Perch to prey distance averaged 2.9 m. Water was the most common substrate from which prey were taken (44% of the observations), followed by air (27%) and grass (14%). Kiskadees also fed off of several types of foliage (7%). Gleaning out of the water or off foliage were the dominant methods of prey capture (71%). Most other prey were captured by hawking out of the air (27%). Sugarberry (*Celtis laevigata*) drupes dominated the diet of kiskadees (30% of identifiable food), followed by invertebrates (23%) and vertebrates (17%). Insects were the most common invertebrate prey (96%; mostly dragonflies) and fish were the most common vertebrates (95%). Two observations were recorded of an adult (an incubating female) consuming fecal sacs produced by the adult itself.

The data presented here show that adult kiskadees have a varied diet consisting mainly of fruit, fish, and invertebrates. It is not surprising that kiskadees spend so much time near fresh water since the bulk of animal prey (fish and dragonflies) is associated with water. Adults will commonly spend many minutes perched between .5 and 1 meter on tree limbs and drop to the water's surface to catch fish. Also, they spend much time scanning the area for dragonflies, fly out to catch them on the wing, and return to the same perch to consume their catch. Only foraging forays of a short distance have been recorded. The observations made of fecal sac consumption are the only ones recorded for kiskadees to date. Although these data contribute to the knowledge of kiskadee diet, it is likely that food brought to nestlings (Gorena in prep.) is more representative of overall adult diet.

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# AN AMERICAN WOODCOCK NEST IN GALVESTON COUNTY, TEXAS

JULIE A. ROBINSON[1] AND GLENN AUMANN[2]
[1]*Department of Biology and* [2]*Energy Laboratory, University of Houston, Houston, Texas 77204-5513*

Woodcocks generally have been considered a regular but rare nester in eastern Texas (Oberholser 1974, Pulich 1977, Texas Bird Records Committee 1995). However, detailed studies have revealed routine nesting in eastern Texas (Whiting and Boggus 1982; Whiting et al. 1985). In fact, as many as 55.5% of females collected in eastern Texas in February showed evidence of imminent egg-laying (Whiting et al. 1985). Nesting is also occasionally reported in central Texas (e.g., Oberholser 1974; Mosier and Martin 1980).

In contrast to the above records, reports of American Woodcock (*Scolopax minor*) nesting in Texas south of 30°N are extremely rare. The Texas Breeding Bird Atlas Project (Texas A & M University, unpubl. data 1987–1992) included five confirmed woodcock nestings north of 30°N, but only a "probable" record in far eastern Jefferson County, and a "possible" record in Chambers County south of 30°N (both north of 29°30′N). Cain et al. (1977) reported a female with chicks seen in San Patricio County (28°06′N).

We report finding an American Woodcock nest in Galveston County (Fig. 1). The nest was found 6 February 1997 with two eggs; on 9 February it had 4 eggs.

Fig. 1. American Woodcock incubating its eggs. Photo by J. A. Robinson.

Fig. 2. American Woodcock nest located at the base of a tallow tree, Galveston Co., Texas, 1997. Photo by J. A. Robinson.

Based on a laying interval of 1 egg per day (Keppie and Whiting 1994), the first egg was probably laid on 5 February.

The nest was at the University of Houston Coastal Center (29°05′N, 95°02′W, immediately west of La Marque and north of Hitchcock), along the gravel road leading in from the main entrance. It was originally located when the incubating female flushed in response to GA clearing nearby Chinese tallow (*Sapium sebiferum*). The nest was at the base of a tallow tree, surrounded by sticks and short brush (Fig. 2, see also detailed description of tallow woodland that included stands on the Coastal Center in Bruce et al. 1995). After the nest was found, further clearing of the area was halted.

On 20 February, the nest was depredated. Two eggs had been removed from the nest and partially eaten, and the other two intact eggs were rolled out. The two intact eggs were cold and covered with dew, suggesting the nest had also been abandoned. Approximately 0.5 m from the nest, we found half of an eggshell containing blood; the bloodied remains of an embryo were nearby on the ground. The remaining two eggs disappeared the following night. These observations are consistent with signs of depredation by an avian predator such as a corvid but possible mammalian predators (e.g., coyote, *Canis latrans,* opossum, *Didelphis virginiana,* or raccoon, *Procyon lotor*) cannot be excluded.

Davis (1961), Cain et al. (1977), and Pulich (1977) suggested that woodcocks were more likely to nest in Texas in years when winter rains are considerably above normal. Causey et al. (1987) suggested that the number of days in January

with mean temperatures ≥4.4°C influenced nesting activity in Alabama. Precipitation around Galveston Bay was above normal in January 1997 (13.51 cm compared to an above normal threshold of 9.65 cm, National Weather Service data) but followed drought in Texas the previous year (Slade and Asquith 1996). Twenty-six days in January had mean temperatures above 4.4°C, which corresponds to conditions favorable for woodcock nesting in Alabama (Causey et al. 1987). However, it must be noted that mean temperatures in January are usually above this threshold along the upper Texas Gulf Coast (National Weather Service data). Another possibility is that the spread of Chinese tallow through the Texas coastal prairie (Bruce et al. 1997) might have the unexpected effect of providing habitat for woodcock nesting outside their usual range.

Previous southern records in Texas also coincided with a possible expansion of the breeding range along its western limit in North Dakota, South Dakota, Iowa, Kansas, Missouri, Oklahoma and Texas (Smith and Barclay 1978). It is possible that American Woodcocks are expanding their breeding range both southward and westward (Keppie and Whiting 1994), and this nesting record is consistent with such an expansion.

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# USE OF GROUND SKINKS (*SCINCELLA LATERALIS*) AS FOOD FOR NESTLING EASTERN BLUEBIRDS (*SIALIA SIALIS*) IN OKLAHOMA

MICHAEL D. BAY AND WILLIAM A. CARTER
*Department of Biology, East Central University, Ada, Oklahoma 74820*

Most birds of the Order Passeriformes generally feed insects to their nestlings (Ehrlich et al. 1988). With the exception of shrikes (Family Laridae), predatory behavior directed towards vertebrates, particularly as a means of supplying food to developing nestlings, could be considered a rare phenomenon (Ross 1989). However, for several breeding seasons, we discovered Eastern Bluebirds (*Sialia sialis*) preying upon and feeding the remains of ground skinks (*Scincella lateralis*) to their nestlings.

Our observations of bluebird nesting habits began in May of 1971 in Pontotoc County, Oklahoma and continue to the present year. We monitored the nesting of bluebirds using nestboxes distributed throughout partially grazed pastureland (190 ha), usually at the edge of pasture and woodland dominated by oaks (*Quercus*) and hickory (*Carya*). Skink predation was not evident until May 1990, when we discovered the body of a ground skink (with tail missing) at the bottom of a nest which contained 5 nestlings. Several days later, we discovered the severed tails of 2 ground skinks at the bottom of the nest of a different breeding pair. In August 1990, while banding nestlings at a different nestbox, we observed a female attempting to deliver a ground skink to 8-day-old nestlings. This skink was never recovered, so we assume that either the female or one of the nestlings swallowed it. This particular nestbox was approximately 90 meters from the first box in which skink remains were discovered, but we do not know if this was a different breeding pair.

We found no skink remains during the 1991 breeding season. In 1992, we discovered severed tails in 3 different boxes after the young had successfully fledged. All three of these nestboxes were active during the same time period (late May–June), indicating 3 different pairs using skinks as nestling food. In 1993, we discovered skink remains in two boxes that were occupied during the same time period and were approximately 180 meters apart. As in 1992, the remains were found at the bottom of the nest after the young had successfully fledged. In one of these nests, the entire body of a skink was discovered, while the other nest contained only the tail. We found no skink remains in nestboxes in 1994 and 1995.

In 1996, we began a more intense investigation into the food habits of nestling bluebirds and monitored several breeding pairs during the course of the season.

Using throat ligatures on nestlings to prevent the swallowing of prey (Johnson et al. 1980) or watching the nestbox with a spotting scope (Pinkowski 1978), we collected or observed delivery of 196 food items, of which 1.5% were ground skink remains. We removed tails directly from nestling throats, and they appeared small enough to be swallowed. In one particular nest, in which throat ligatures were not used, we discovered the body of a skink (with tail missing) in the nest with 5 eight-day-old nestlings. Apparently, the skink was too large for the nestlings to swallow.

Predation on small vertebrates, such as the ground skink, and using them as nestling food may be a frequent behavior of some passerine birds like the shrike (e.g., Mulvany 1984; Ross 1989; Tyler 1991), but rarely is this observed in other passeriform species, like the Eastern Bluebird. However, ground skinks may be an abundant food source in suitable habitats such as the Oak-woodland areas in eastern Oklahoma (Webb 1970) and Bay (pers. observ.) encountered them daily in the ground litter around nestboxes on the study site. Bluebirds likely encounter skinks using the fly-down technique, in which a bird perched on a low limb scans the ground for activity and then flies to the ground to seize prey (Goldman 1975; Pinkowski 1977). Upon being attacked, the tails of skinks may autotomize due to the autotomy septum between some of the caudal vertebrae (Walker 1987). However, as was the case in this study and others (Beane and Trail 1991), the entire skink may be captured and offered as food to nestlings.

Usual or frequent nestling foods for the Eastern Bluebird include a variety of invertebrate prey, mostly Lepidoptera and Orthoptera insects (Pinkowski 1978; Pitts 1978). Predation on small vertebrates, though rare, will probably occur when they are encountered during the search for usual insect prey. Beane and Trail (1991) report 12–18 instances of a single breeding pair of bluebirds in North Carolina feeding ground skinks to their nestling. Gaylord (1995) observed a male Western Bluebird (*Sialia mexicana*) attempt to deliver a possible western fence lizard (*Sceloporus occidentalis occidentalis*) to nestlings in Oregon. Pitts (1978) reports of a 10 cm skink (listed as a probable *Eumeces laticeps*) that was successfully fed to a fully grown bluebird nestling (>10 days old). Younger nestlings may have difficulty swallowing such a bulky item, and indeed this may explain the presence of skink bodies in our nestboxes. In our study, we observed skink tails fed to 5 and 6 day old nestlings that could have been successfully swallowed, yet in other nests with nestlings the same age, tails were found in the nest bottom. It may be possible that tails were delivered to some 5–6 day old nestlings several days earlier, when swallowing may have been more difficult due to the size of the nestling or skink tail.

In addition to the reports of lizard prey being fed to nestlings, Eastern Bluebird adults have also been reported to prey and feed upon snakes (Flanigan 1971), tree frogs (Beal 1915) and shrews (Pinkowski 1974). These rare reports of vertebrate prey in the bluebird diet suggest that the foraging behavior of the Eastern Bluebird, whether for self maintenance or for growing nestlings, may be described as "opportunistic searching" in which adults form a search image (Tinbergen 1960) on prey items based on their availability or abundance and thus greater frequency of encounter, than by selective choice (Beal 1898; Pitts 1978).

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# NOTES AND NEWS

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JACK CLINTON EITNIEAR, Editor

% Center for the Study of Tropical Birds, Inc.
218 Conway Drive
San Antonio, Texas 78209-1716